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Maternal perception of fetal motor activity

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Summary and conclusions

A technique using real-time ultrasound for comprehensive recording of fetal motor activity was used in 20 subjects in the third trimester of pregnancy. Maternal awareness of fetal movement correlated with the number of fetal parts contributing to the movement but not with maternal parity or obesity, gestational age, placental site, or duration of the fetal movement. Some subjects recorded fetal breathing, passive fetal displacement, and Braxton Hicks's contractions as fetal movement. Most of our subjects were consistent and accurate in their perception of major fetal movements, but a few were inconsistent and one was completely unaware of major fetal movements.

These results suggest that kick counts kept by most mothers will be accurate. Low counts of fetal movement should be an indication for fetal monitoring by other means and not, unconfirmed, for intervention.

Introduction

Maternal awareness of decreased fetal activity is a sign of fetal hypoxia.[1-3] The number[1 2 4] and intensity[5] of fetal movements decrease with deteriorating fetal condition. When movements disappear altogether, 12-48 hours before fetal death,[2 4] the fetal cardiotocograph is already abnormal.[6] The mother's record of the daily count of fetal movements is a more specific indicator of fetal compromise than serial urinary oestrogen measurements.[2] Cheapness and simplicity make the kick count a globally useful method of fetal monitoring. Sadovsky and Yaffe[1] and Pearson[7] anticipated that maternal perception of fetal movement might show subjective variation. Objective methods of assessing fetal movement including palpation by an observer[8] and using a strain gauge,[8] a tocodynamometer,[9] an electromagnetic recorder,[10] and an impedance plethysmograph[4] have been reported as showing good agreement with maternal counts of fetal movement. Using real-time ultrasound Gettinger *et al*[11] were the first to question the sensitivity of these methods. A mean of 57% of fetal movements detected by ultrasound were not perceived by their subjects, who showed a wide range of sensitivity to fetal movement. This finding does not question the value of kick counts, provided that each mother has a constant sensitivity to the movements of her fetus.

This study was designed to investigate further the kick count. We describe a technique for comprehensively observing the fetus using real-time ultrasound, which we used to record movements of all fetal parts and to determine which physical variables influenced maternal perception. We then assessed our subjects' consistency at detecting fetal movement during three periods of observation.

Subjects and methods

We studied 20 pregnant women between 32 and 43 weeks' gestation. They were all used to recording fetal movements. Obstetric complications included diabetes mellitus (six cases), hypertension (three), cervical cerclage (three), intrauterine growth retardation (two), placenta praevia (two), postmaturity (one), mitral valve disease (one), and chronic bronchitis (one). There was one normal pregnancy. Ultrasound examination was performed using two real-time scanners. The subject lay semi-recumbent, with a pillow under her right side, to prevent supine hypotension. The transducers were held in place with universal clamps. One transducer recorded cross-sections of the fetal head and arms, the other of trunk and legs. Views of trunk, head, and at least one arm and one leg were obtained in all sessions. We tried to view all four limbs continuously, but this was not always possible: arms particularly moved out of the picture, and the posterior leg was sometimes hidden in acoustic shadow.

We studied 10 subjects for a single 30-minute session and 10 for three 30-minute sessions at weekly intervals. Fetal hiccoughs occurred during four sessions. The importance of fetal hiccoughs is not known,[11] but subjects always perceived them as a series of kicks, giving high counts of movement. We abandoned the sessions in which fetal hiccoughs occurred and repeated them later. Many subjects recorded Braxton Hicks's contractions as movements. We therefore specifically ascertained that subjects could differentiate contractions from movements, and asked them to ignore contractions. Apart from this, subjects decided for themselves what constituted a fetal movement and recorded the start and end of each movement using a hand-held recorder attached to a computer-tape punch. The ultrasound images were simultaneously videotaped. Television monitors were placed outside the subjects' field of vision. The start of the video recording was carefully synchronised with that of the subject's observation period.

The videotapes were later analysed by one of us, the beginning and

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end of each movement being punched. The tapes were reviewed to produce an independent record of head, trunk, arm, and leg movements. The five tapes for each session—that is, the maternal record and tapes for each of the four fetal parts—were analysed to give the number and incidence of movements for each fetal part. The tapes were also combined to give a complete visual record of each session (fig 1). We defined movements on different tapes as synchronous when there was either a time overlap or an interval of less than two seconds between them (fig 1). By analysing synchronous movements we assessed the clustering of fetal movements and the effect that maternal and fetal variables had on maternal recognition of fetal movements.

Since our system did not measure the velocity or excursion of fetal movement, we defined a major movement as one that affected all four fetal parts and lasted over five seconds. The incidence of movement for a fetal part was defined as the proportion of session time during which that part was seen to move. The total incidence of fetal movement was the proportion of session time during which any fetal part was seen to move.

Results were recorded as means ± SE of means.

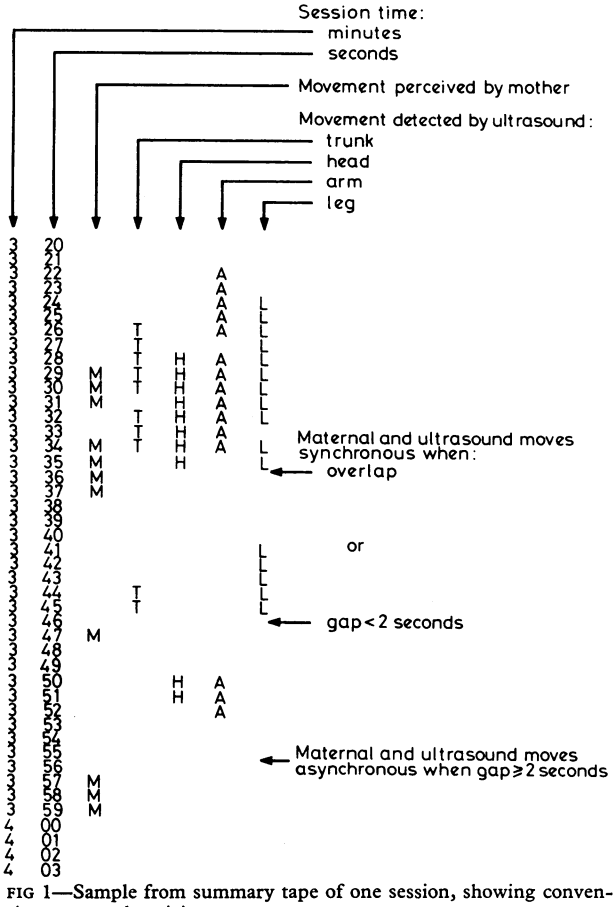

FIG 1—Sample from summary tape of one session, showing conventions on synchronicity.

Results

MOVEMENTS PERCEIVED

Figure 2 summarises results from the first session for each of the 20 subjects. Subjects detected a mean of 33% (range 0-100%) of all movements detected by ultrasound. Subjects 8 and 14 recorded no movements, although ultrasound detected two and 13 respectively. Subjects 1, 19, and 20 recorded movements when vigorous fetal breathing but no other fetal activity was visible: they reported sensations of fluttering, rippling, or "like butterflies." Subject 10 recorded many movements when no fetal activity was seen; the fetus was, however, undergoing regular passive movement owing to maternal aortic pulsation and respiration. This passive movement was felt as a rippling sensation. Subject 11, despite the instruction, recorded Braxton Hicks' contractions as movements.

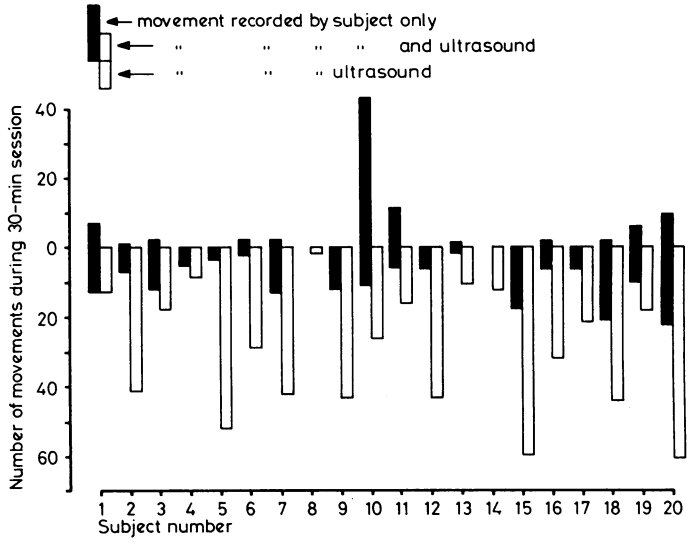

FIG 2—Numbers of fetal movements recorded by each mother and detected by ultrasound (initial session for 20 subjects).

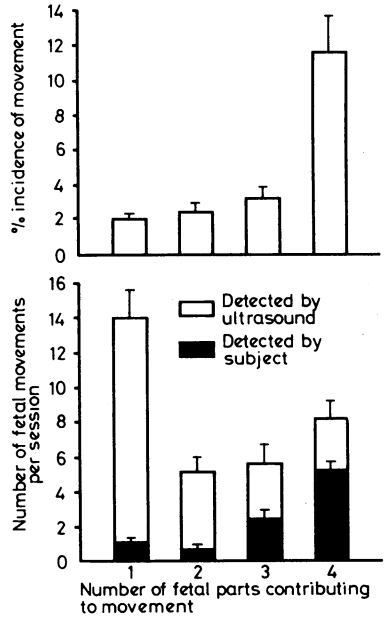

FIG 3—Mean (± SE of mean) incidence and number of fetal movements per session related to number of fetal parts contributing to movement (20 subjects).

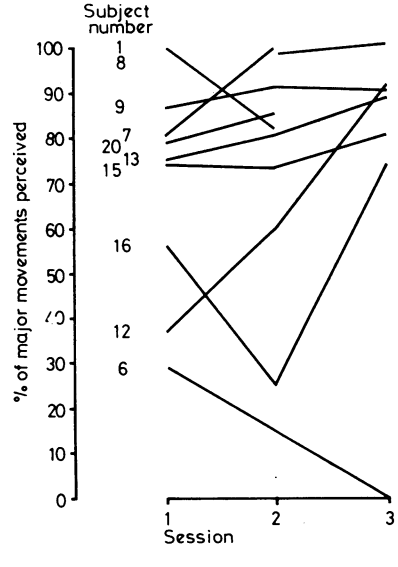

FIG 4—Maternal perception of major fetal movements during three serial sessions in 10 subjects.

VARIABLES AFFECTING PERCEPTION

Fetal part—There was no significant difference between the proportions of movements of each of the four fetal parts detected by the mother (42·7±5·9% for trunk; 36·7±5·3% for head; 35·1±5·3% for arm; and 39·3±5·4% for leg movements).

Number of fetal parts contributing to movements—Figure 3 shows the clustering of fetal movements. Two-thirds of the total incidence was occupied by movements of all four fetal parts. The likelihood of a movement being perceived increased with the number of fetal parts contributing to it, from under 8% for movements of an isolated fetal part to 63% for movements of all four fetal parts.

Duration of movement—The mean duration of movement increased with the number of fetal parts contributing to the movement (fig 3) but was not significantly correlated with the percentage of movements perceived when movements of one, two, three, and four fetal parts were considered separately (P > 0·2 in each case).

Parity—Primigravidae perceived 68·3±8·1% of major movements and 35·5±7·6% of all fetal movements, while multigravidae perceived 56·5±10·7% and 27·4±6·8% respectively. These values were not significantly different (P > 0·3 in each case).

Gestational age—There was no correlation between gestational age and the proportion of either major fetal movements ($r = 0·28$, P > 0·1) or all fetal movements perceived ($r = 0·31$, P > 0·05).

Placental site—Subjects with an anterior placental site perceived 55·5±9·6% of major fetal movements and 25·7±6·7% of all movements, while those with a posterior placental site perceived 68·0±10·0% and 38·4±9·8% respectively. These results were not significantly different (P > 0·3 in each case).

Obesity—We measured left subscapular skinfold thickness in 15 subjects. There was no correlation between this parameter and the proportion of either major fetal movements ($r = 0·1$, P > 0·3) or all fetal movements perceived ($r = -0·2$, P > 0·2).

CONSISTENCY

Figure 4 summarises results from serial sessions in 10 subjects. Only major movements were studied because of the high incidence of maternal perception of these movements. When only two results are shown for a subject the third session included no major fetal movements. Seven subjects (1, 7, 8, 9, 13, 15, and 20) consistently perceived major fetal movements. In this subgroup within-subject variability was less than between-subject variability. The three patients who felt less than half of the major movements during at least one session (6, 12, and 16) were inconsistent in perceiving major movements. In this subgroup within-subject variability was greater than between-subject variability.

Discussion

Most objective methods of recording fetal movement detect those movements that distort the shape or electromagnetic properties of the mother's abdomen. Workers using these techniques have reported good agreement with maternal counts of fetal movement and have concluded that mothers reliably record fetal activity. Since no published estimates of sensitivity for these techniques exist, the proportion of fetal movements that they detect cannot be measured. We have described a technique using real-time ultrasound that permits the observation and comprehensive recording of fetal movement. This technique is not yet suitable for routine fetal monitoring: it is a research tool that will permit detailed study of normal and abnormal patterns of fetal activity and the evaluation of other methods of recording fetal movement. At present it cannot measure the force and excursion of fetal movement.

With this technique we found that fetal breathing, fetal hiccoughs, passive fetal displacement, and Braxton Hicks's contractions may be recorded by the mother as fetal movement. We confirmed[11] the occurrence of many movements that mothers do not perceive. Most of our subjects were sensitive to major fetal movements, and reported them consistently; a few were inconsistent in their recording, and indeed one was unaware of even major fetal movements. The number of fetal parts contributing to a movement was the only variable that correlated with maternal detection of movement. No individual fetal part had a disproportionate influence, and the duration of the movement was unimportant. Maternal sensitivity to fetal movement did not seem to depend on gestational age, maternal age,[11] parity, or obesity. Low sensitivity to fetal movement has been linked with an anterior placental site[12]; this was not true for our subjects.

Maternal awareness of fetal activity has been correlated with intelligence and neuroticism. Psychological, not physical, factors may determine maternal sensitivity to fetal movement. Since it would be useful for clinicians who depend on kick counts for fetal monitoring to be able to identify the few insensitive mothers, we plan a further study of potential psychological correlates of sensitivity. We also plan to find out whether a mother who is insensitive to fetal movement can learn to appreciate movement by watching the activity of her fetus on the real-time ultrasound screen.

It is standard practice to allow mothers who are recording kick counts to decide for themselves what constitutes a fetal movement.[2 4 7] This study shows the need for more-detailed instructions. Mistaking Braxton Hicks's contractions or passive fetal displacement for fetal activity may lead to false reassurance. After the end of this study a primigravid patient of ours, mistaking Braxton Hicks's contractions for continuing fetal movements, did not seek help when her fetus stopped moving; it died in utero at 36 weeks' gestation. While fetal hiccoughs indicate fetal life, their importance is not known.[13] Fetal breathing indicates fetal health[13] but is described in the same terms as passive fetal displacement. We recommend that patients recording kick counts should be instructed to record none of these activities as fetal movement. Most patients should be able to identify and then ignore them; many will already be aware of them. A few patients may need a session of observer palpation or real-time ultrasound scanning to ensure a common understanding.

The results of this study suggest that most mothers are consistent in reporting major fetal movements. Kick counts kept by this majority would be accurate and reliable. A few mothers are insensitive to fetal movement, and a few may be inconsistent in their reporting. We recommend that a low count of fetal movement should be an indication for fetal monitoring by other means and not, unconfirmed, for intervention.

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